State Water Resource Control Board (State Water Board) Staff Questions

Aquifer Exemption Application
Cat Canyon Oil Field

State Water Board staff (Staff) are in the process of reviewing the "Sisquoc and Monterey Formations Aquifer Exemption Application, Cat Canyon Oil Field, Santa Barbara County, California" prepared by WZI, Inc. and the Division of Oil, Gas, and Geothermal Resources (DOGGR) dated October 2017, and received December 22nd, 2017 (Application). The Application proposes to expand the exemption area for the Sisquoc Formation, below the Upper Confining Layer, and the Monterey Formation at Cat Canyon Oil Field. During our review, questions were identified and are included in this document. State Water Board staff request additional information to assess whether the proposal satisfies Federal and State regulations.

General

1. Several water wells were found within the proposed aquifer exemption and a one-mile buffer search area (see attachment *WaterWellSurvey-CatCanyon2017_MC*) that were not included in the originally submitted *Appendix 5-II Water Well Table*. Please add these wells to the submitted table.

Code of Federal Regulations (CFR) 146.4(b) and CFR 146.4(c)

2. The application does not include evidence of the presence of hydrocarbons, nor water quality data for the Sisquoc Lower Confining Layer. It is unclear whether or not this member meets the federal exemption criteria.
    - What evidence is there that this member satisfies CFR 146.4 (b1) or (c)?
    - Please provide the well API numbers (and locations) of underground injection control (UIC) wells that are screened across this interval, and the screened interval depths.

California Public Resources Code (PRC) 3131(a)(2)

3. Please account for the low total dissolved solid (TDS) water quality data (one data point; 2800 milligrams/Liter (mg/L)) within the Sisquoc Formation in the northern portion of the Sisquoc Area, and values less than 5,000 mg/L in the Sisqouc and East Areas (Figure 5.1-17).

4. Data from Table 5.1-5, page 107 of the Application does not appear to match the data entered in Table 1.1-1 on page 2 or Table 6.1-1 on page 120 (specifically the top two rows within the Sisquoc Area, "All Sisquoc Data" and "Sisquoc: Post Steaming Production). Please comment on this discrepancy.
    - Referring to Table 1.1-1, the data displayed for the Monterey Formation is identical for the East Area and the Central Area. Please comment on this coincidence.

PRC 3131(a)(3)

5. The application seeks to extend the aquifer exemption boundary to the north, specifically into T10N R33W sections 33, 34 and 35 and outside of the current Cat Canyon Oil Field boundary. What evidence is there that this area meets CFR 146.4 (b1) or (c), or PRC 3131 (a)? Please respond considering the following points:
    - Thinning cap rocks in the Upper Sisquoc Confining Layer (0-200' feet thick) as well as public water wells in that area and unconfined aquifer flow in NW direction.
    - Figure 6.3-2 indicates development outside of the current exemption area occurs in T09N R33W sections 2 and 3. According to DOGGR Wellfinder, no wells are currently injecting in section 3, and the only injection well in section 2 appears to fall close to or inside of 1973 productive limits.
    - Cyclic steam injection wells do exist in the section 2 non-exempted zone, but none into sections 33, 34 and 35 referenced above.

6. In Figures 1.2-1 and 5.1-19, the structural contours appear to map the S1b sand (although not entirely clear), is this correct? Why do these structural contours continue beyond the line of the "Approx. S1b Pinchout" on the western edge of the proposed area? If the structural contour is of a different formation beyond the S1b pinchout please clearly label the figures.
    - Please provide an isopach/isochore map of the S1b sand within the proposed exemption area.

7. Table 6.2-2 shows the 2016 mass balance by areas and formation, but only accounts for one year and claims "2016 data appears to be confounded by a records problem."
    - Please clarify.

8. Why is 2016 data used in Table 6.2-2 (mass balance by area and formation) but 2015 data is used in Table 6.2-3 (mass balance by formation and fault blocks)?
    - Please include data that indicate mass balance by area for all recorded data since 1977 (Table 6.2-1) in a manner similar to Table 6.2-2, and discuss any areas of net injection over time.

Additional Questions

<u>Aquifer Exemption boundary:</u>

9. Why is the S1B sand pinchout being used extensively for the horizontal boundary for both the Sisquoc and Monterey Formations in the northern and southern portions of the proposed area when all the Sisquoc sands are proposed for exemption? Do any of the lower sands extend beyond the proposed boundary? If so, which sands and to what extent?

10. Why does the boundary extend laterally beyond and outside of the S1B sand, particularly in the southern and western-most boundaries? Figure 6.3-2 shows no development outside of the current exemption in the area, and the proposed boundary seems to closely follow the existing.
    - For clarity, please provide a map showing existing exempted boundary and proposed exempted boundary together on the same map.

11. Please explain the purpose of changing the exempted boundary on the western-most edge? The proposed boundary appears to be following faults/features in the Monterey Formation (Figure 5.1-20). How does this boundary meet State of California containment requirements under PRC 3131 (a) for both the Sisquoc and Monterey Formations?

12. East side of field: why does the proposed boundary cut across structure between the Garey Fault to the un-named fault to the west?

13. Why is the un-named fault (believed to be the lone non-sealing "Fugler" normal fault described in the application) shown on the map as sealing along the southern trace (area of T08N R32W Sec10; Figure 1.2-1) and on cross section A—A'.
    - Please provide a map and cross-section (ex. A—A') with the "Fugler" fault labeled.

14. Please clarify the purpose of extending the proposed AE boundary into section 23 in the southern-most area (outside of current Cat Canyon Oil Field boundary)? How does this area meet federal and state exemption criteria?

Comments

Page 9 of the application, under Agricultural Wells states: "*There are agricultural water wells completed in the Careaga Formation and the Foxen Formation located above the Sisquoc Formation below the Upper Confining Layer' confining layer[5] and the Sisquoc Formation below the Upper Confining Layer oil sands.*"

Page 126 of the application, under the heading **6.1.2.2 Sisquoc Formation below the Upper Confining Layer** states: "…*The deposition of the Sisquoc Formation below the Upper Confining Layer was later and somewhat coincident with the uplift depositing the coarse sands in the near shore marine and the fine-grained clays in the deeper marine areas. After sand deposition, uplift continued placing the clay seal in an elevated structure at the southern end of the field*…"

This language in both statements is unclear and should be restated.